GUIDELINES

FOR THE PREPARATION

OF SITE SPECIFIC APPLICATIONS

Prepared by the
New Hampshire Department of Environmental Services
Water Division
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I. INTRODUCTION

Protecting the quality of New Hampshire's water is one of the important responsibilities of the N.H. Department of Environmental Services (DES). New Hampshire's rivers, streams, ponds, and lakes, which provide valuable recreational, health, and economic benefits consist of ecosystems that require constant vigilance from man-made degradation.

One program at DES for the protection of surface water quality is the Site Specific or Alteration of Terrain program. This program regulates erosion control on projects under construction and stormwater impacts from a project once complete. The programs Administrative Rules, Env-Ws 415 require that no earth disturbance of 50,000 square feet or more if in the Protected Shoreland, as defined by the Comprehensive Shoreland Protection Act, RSA 483-B, or 100,000 square feet or more in all other areas, can take place without first obtaining a Site Specific permit from DES. These permits contain erosion control provisions that must be met during the project construction. In addition these permits contain provisions that regulate the rate of discharge and quality of stormwater from the project when completed.

Some might ask, why is erosion control necessary? The answer is varied. The loss of rich, fertile, topsoil is a resource waste that our state can ill. afford, be it form forest or farmland. Further, soil erosion results in siltation of surface waters, degrading habitat for numerous aquatic organisms. The viability of our state's fragile lakes, ponds, rivers, and streams is jeopardized when silt covers bottom habitat. Moreover, nutrient-rich silt can lead to an overgrowth of undesirable, life-choking vegetation in our waterbodies, often leading to the destruction of fisheries and recreational opportunities. Also, siltation can sometimes affect surface waters used for public drinking water supplies. However, if proper care is exercised during construction operations, soil erosion and the resulting siltation can be minimized.

In addition to the erosion controls utilized during construction, permanent controls on the impacts of stormwater must be built into the project. These controls involve such BMPs as extended detention ponds, wet ponds, treatment swales, vegetated buffer strips, etc. The purpose of these controls is twofold: (to mitigate the effects an increase in runoff may have in a particular watershed and (2) to implement controls on potential sources of nonpoint pollution.

This publication is intended to serve as guidelines for designers of developments and other earth

disturbances that require DES' Site Specific Permits. It describes the regulatory permitting process and what DES is looking for in a Site Specific application.

For further information, please feel free to contact the Department of Environmental Services' Site Specific Program at 271-3503.

II. PREPARING AN APPLICATION

A. General

An application package for submission to DES should consist of the completed application form together with the required supporting documentation and the appropriate fee. The following pages contain a list of basic or general requirements for project submittal. It should be kept in mind that these are for general guidance only and a particular project may require more or less detail.

The completed application package should be forwarded to:

NHDES
Water Division
6 Hazen Drive
PO Box 95
Concord, NH 03302-0095

Page 16 of this section contains a copy of the check list used for the review of site specific applications. This has been included to show what the Division looks for during a review and to help the preparer make sure his/her application is complete.

B. Basic requirements for RSA 485-A:17 Site Specific submittals

A complete application shall include the following:

1. Completed application form and USGS locus map showing project location
2. Appropriate application fee

3. Narrative, usually contained in the drainage report, should contain the following:

(a) Project description

- Type of development, i.e., residential, commercial, industrial, borrow pit, etc.
- Location (street, and town or city)
- Size of project including proposed total area of disturbance
- Construction activities...roads, structures, etc.

(b) Existing Site Conditions

- Slopes
- Ground cover
- Soil type in construction areas; either NRCS (formerly SCS) or HISS
- How offsite and onsite stormwater will be controlled
- Critical erosion control areas

4. Types of plans required

(a) A Site Plan is required for projects involving only roadway construction or excavation activities and a Detailed Development Plan is required for all other projects requiring a Site Specific application.

(b) A Site Plan must be drawn to a scale of 1" = 100' or less and have a contour interval of 5 feet or less. A detailed Development Plan must be drawn to a scale of 1" = 50' or less and a contour interval of 2 feet.

5. Pre-development drainage plan

(a) Show the following on one plan:

- Existing contours
- All tributary drainage areas, including offsite areas draining into the project area

(b) For each drainage area, show the following:

- Area (acres)
- Average watershed slope (percent)
- Hydraulic length or labeled flow paths (Ft.)
- Time of concentration (Tc)
- If using the rational method, the "C" factor; or the curve number (CN), if using the NRCS Method
- The peak runoff (Q) in cfs for a 10-year frequency storm event
- Soil types; either NRCS or HISS

(c) All wetland areas, water bodies, streams, water courses and drainageways, year-round and intermittent

(d) Plan must bear the seal of an engineer licensed to practice engineering in the state of New Hampshire.

6. Post-development drainage plan

(a) Show the following on one plan:

- Existing and final contours
- All tributary drainage areas, including offsite drainage areas
- The complete storm drainage system, including size, slope and invert elevations of all pipes and culverts, and all treatment and detention measures
- Roadway stations every 100 feet
- Location of proposed temporary and permanent erosion control measures

- Location of permanent water quality protection measures, such as treatment swales and sedimentation ponds
- Location of any detention or retention ponds

(b) For each drainage area, show the following:
- Area (acres)
- Average watershed slope (percent)
- Hydraulic length or labeled flow paths (ft.)
- Time of concentration (Tc)
- If using the rational method, the "C" Factor; or the curve number (CN), if using the NRCS Method
- The peak runoff (Q) in cfs for a 10-year frequency storm event

Note: If appropriate, pre-development and post-development drainage plans can be prepared as one plan sheet.

(c) Plan must bear the seal of an engineer licensed to practice engineering in the State of New Hampshire.

7. Drainage calculations

The storm drainage calculations should include the following:

(a) The method for determining peak flows; for example, the rational or NRCS method.

(b) The storm frequency used - Water Supply and Pollution Control Division minimum requirement is a 10-year frequency storm.

(c) The method for determining Time of Concentration (Tc); (Note: The use of the NRCS TR55 method is preferred. The use of the "Kirpich" chart is discouraged except for small drainage areas on paved surfaces.)

(d) A table summary of the storm drainage calculations showing the following

for each drainage area:

- Area
- CN or C
- Tc for each run in minutes or hours
- Intensity I in/hr when Rational Method is used, or total rainfall if NRCS method is used
- Peak flow Q, cfs
- Pipe size
- Manning's roughness coefficient, n
- Slope in feet/ft
- Velocity, ft/sec
- Comparison of pre-development and post-development Q

(e) Submit a copy of all reference charts used in determining:

- Intensity (I)
- Time of Concentration (Tc)
- Runoff coefficients (CN or C)
- Nomographs used for sizing pipes, swales, or detention basins

(f) Submit the worksheets showing derivation of CN or C value for each drainage area

(g) Submit drainage calculations demonstrating that downstream structures have adequate capacity to handle post-development flows

(h) Drainage calculations must bear the seal of an engineer licensed to practice engineering in the State of New Hampshire.

9. Flood Protection

The following information should be submitted:

(a) The predevelopment Q and post-development Q for each drainage area

(b) For drainage areas showing an increase in runoff; a method of decreasing the runoff, or justification for not doing so

(c) All calculations for sizing any retention or detention basins

(d) Necessary easements for detention basin, drainage ditches, swales, storm drains, etc.

(e) Typical cross section of any retention or detention basins.

Note: A detention/retention basin designed for a storm of higher discharge than the 10-year frequency event must also provide the staged detention and discharge for the lesser 10-year frequency storm.

10. Treatment

Permanent stormwater treatment must be provided to treat stormwater runoff from impervious surfaces such as roads, parking lots, roofs, etc. The following discussion gives design guidance for common stormwater treatment measures. For a more detailed discussion the reader is referred to the publication "Best Management Practices for Urban Stormwater Runoff" available from DES, see order form at the end of these guidelines.

(a) Vegetated Filter Strips

- The filter strip should directly abut the impervious area or a level spreader should be constructed at the top of the strip to distribute the flow.

- Wooded filter strips are preferred to grass strips. If an existing wooded strip does not exist, the grassed strip should be managed to allow woody vegetation to colonize the strip.

- Flow to the filter strip should not exceed 0.5 cubic feet per second/foot of filter strip width, during a two-year storm event.

- Filter strip slope should not exceed 15 percent.

- The minimum width of the filter strip should be 75 feet.

(b) Grassed Swales

- Minimum length 100 feet.

- Swale bottom slopes as flat as possible, swale can be terraced to achieve flat slope.

- Swale side slopes no-steeper than 3:1 (h:v).

- Maximum water velocity during a ten year storm of one foot per second (fps).

- Maximum flow during a ten year storm of ten cubic feet per second (cfs).

- A dense cover of water tolerant, erosion resistant grasses should be used.

- Underlying soils should have sufficient percolation rate so that the swale will drain in twenty-four hours.

- The bottom of the swale should be at least two feet above the seasonal high water table and bedrock.

- Check dams are recommended to promote pollutant removals.

- Erosion protection as required should be provided at the swale inlet and outlet.

- Swale should be capable of conveying design storm of upstream drainage system without eroding.

(c) Extended Detention Ponds

- For adequate pollutant removal a minimum of 24 hours of extended

detention must be provided for two-year storm event. Adjustments should be made in the outlet control device so that smaller runoff events are detained for at least six hours in the pond. Longer detention periods may be needed for streambank erosion control. And as a final check, the release rates should be evaluated to determine if they are erosive. The basin should be designed with a drawdown time of 24 to 40 hours.

- A two stage design is recommended. The upper stage will be dry except during larger storm events, and the lower stage sized to be regularly inundated. The lower volume will be the site of the bulk of the pollutant removal, and will handle about 50-90% of the storms. A stone lined pilot channel should be constructed from the inlet to the lower stage. In general the basin should be wedge shaped with the inlet at the narrow end of the basin. The shape of the basin should have a length to width ratio of 3 or more. Dead storage areas should be avoided to allow for full utilization of the basin.

- If a shallow marsh is to be utilized in the basin the depth should be not less than 6 inches and not more than 24 inches. The average depth of the temporary storage area should normally not exceed 10 feet. A shallow basin with a large surface area is preferable to a deeper one with a smaller surface area.

- Side slopes of the extended detention pond should be no steeper that 3:1 (h:v) and no flatter than 20:1. Access and safety should be considered in determining proper basin side slopes.

- A buffer of dense vegetation or fencing should be provided to limit access.

- Pond berm may be classified as a dam and require approval by the Water Resources Division of DES

(d) Wet Ponds

- Wet ponds should have an average depth of 3 to 10 feet in the permanent pool to prevent turbulent resuspension of the sediments.

- The maximum depth should be no greater than 15 feet to avoid thermal stratification and associated release of phosphorus from the sediments.

- Twenty five to thirty percent of the permanent pool surface area

should be a maximum of 18 inches deep to promote wetland plant colonization along the pond edge.

- The permanent pool should be designed to hold the volume of runoff generated by a two-year storm over the entire contributing watershed area.

- Sufficient detention time is critical to the wet ponds effectiveness. Phosphorus is removed by sedimentation of fine particles and by biological activity.

- Sediment storage should be provided in the permanent pool.

- At least one foot of ice cover should be provided for.

- The pond should be wedged shaped with the narrow end at the inlet and the permanent pool at the outlet end.

- Ponds should have a length to width ratio of 3:1 of greater, with the inlet and outlet as far apart as possible.

- Two or more ponds in a series provide the most effective treatment. The first pond experiences some mixing as incoming runoff meets still water, but water is pushed into subsequent ponds at a steady rate that discourages mixing and promotes plug flow. Multiple ponds also restrict wind-generated mixing over the total volume of the pond. Overflow outlets should be installed between ponds to ensure that water is released from the top of the pool.

- The first pond, (for a multiple pond system) or the pond (for a single pond system), should be equipped with a sediment forebay equal to ten percent of the pond area, approximately one foot deep.

- Ponds should have side slopes no steeper than 3:1 (h:v) nor flatter than 20:1.

- Steep drop offs should be avoided.

- If steep drop offs can not be avoided then some type of restriction such as fencing or dense vegetation should be provided to restrict access.

- The elevation of the pond's outlet should be a minimum of one foot above the seasonal high water table to prevent a continuous discharge of water from the pond and continuous flow of water into the pond.

- Outflow from the pond should be to a stable channel.

- Pond berms may be classified as a dam and require approval by the Water Resources Division of DES

(e) Constructed Wetlands

- The design of wetlands for treating urban runoff is a new field without a lot of generally accepted design standards. The following standards are minimum standards, and are intended to give direction without being too restrictive as new technology is developed. It should also be understood that these standards are not all inclusive regarding the design of constructed wetlands, but are intended to address those areas unique to urban runoff. The designer must have a general knowledge of wetlands creation including soils, hydrology, and vegetation.

- The volume of storage capacity below the outlet (water quality volume) should be equal to a one inch of rainfall over the tributary area.

- Surface area of the wetland should be a minimum of 2% to 3% of the watershed area.

- The wetland should have two micropools comprising between 20% and 40% of the total wetland water quality volume.

- The first micropool to be a sediment forebay and contain 10% of the total wetland water quality volume.

- The second micropool to be an afterbay and contain 10% to 30% of the total wetland water quality volume.

- The micropools should be a minimum of 3 feet and a maximum of 6 feet deep

- The wetland between the two micropools should be a marsh with variable depth between 6 inches and 2 feet deep.

- The outlet of the sediment forebay to the marsh should be designed to evenly distribute the flow over the marsh.

- The length of the basin should be at least twice the width.

- Inlets and outlets should be at opposite ends of the wetland, if this can

not be accommodated, then baffle islands should be constructed to maximize the flow path.

- A hydrologic budget should be prepared for the design demonstrating that sufficient water is available to maintain the wetland, and that the wetland will not be inundated with an excess of water.

- The marsh portion of the wetland should be designed with a dense, well distributed stand of vegetation such as cattails or bulrushes.

- If the wetland is also utilized for stormwater detention, it should be designed based upon extended detention.

- Maximum sideslopes should be 2:1, provision must be made for access by maintenance equipment.

- The constructed wetlands should have a freeboard of at least one foot.

- The outlet should be a reverse slope pipe or other device which will allow water from below the surface to outlet, thus trapping floatable solids.

- Outlet should be installed with suitable anti-seep collars.

- Inlet area should be protected from erosion with suitable riprap or the inlet enter the pool below the water surface.

- A buffer of dense vegetation or fencing should be provided to limit access

- Wetland berms may be classified as a dam and require approval by the Water Resources Division of DES

(f) Infiltration Trenches

- An infiltration trench should range from 2 to 10 feet in stone reservoir depth.

- The trench system storage volume should be equivalent to the volume of runoff generated by a 2 year-24 hour storm, less expected infiltration.

- The maximum storage time(time to drain) should be 72 hours.

- The depth to seasonal high water table and bedrock should be at least 4 feet below the bottom of the trench.

- The backfill material should consist of a clean aggregate material with a maximum diameter of 3" and a minimum diameter of 1-1/2". Void spaces in these aggregates is assumed to be in the range of 30 to

40%. The aggregate material should be completely surrounded with a geotextile fabric.

- An observation well should be installed in every infiltration trench.

- All trenches should be excavated using light equipment, taking care not to compact the underlying soils.

- A trench can also be used under a grassed swale to improve the performance of the swale. A trench with a grassed surface should consist of at least one foot of soil above the stone.

(g) Infiltration Basins

- The floor of the basin should be graded as flat as possible to permit uniform ponding and exfiltration. Low spots and depressions should be leveled out. Side-slopes leading to the floor should have a maximum slope of 3:1(h:v) to allow for easier mowing and better bank stabilization.

- All basins should have sediment forebays or riprap aprons that dissipate the velocity of incoming runoff, spread out the flow and trap sediments before they reach the basin floor.

- The storm drain inlet pipe (or channel) leading to the basin should discharge at the same invert elevation as the basin floor. Similarly, the low flow orifice in an infiltration/detention basin should be set at the same elevation as the basin floor, to prevent baseflow from ponding and thus impeding the function of the basin.

- The floor of the basin should be stabilized by a dense turf of water tolerant reed canary grass or tall fescue, immediately after basin construction. The grass turf promotes better infiltration, pollutant filtering, and prevents erosion of the basin floor.

- The basin should be excavated with light equipment with tracks or over-sized tires to minimize compaction of the underlying soils. After the basin is excavated to the final design elevation, the floor should be deeply tilled with a rotary tiller or disc harrow to restore infiltration rates, followed by a pass with a leveling drag. Vegetation should be established immediately. The riser, embankment, and emergency spillway should be sized and constructed to the normal specifications for conventional ponds.

- A minimum buffer of 25 feet from the edge of the basin to the nearest adjacent lot should be reserved. A landscaping plan should be prepared for the basin buffer that emphasizes low maintenance, water tolerant, native plant species that provide food and cover for wildlife, and when necessary, can act as a screen.

- Basin should be equipped with an emergency spillway.
- Adequate access to the basin floor should be provided from a public or private right-of-way that can withstand light equipment. Such access should be at least 12 feet wide, and should not cross the emergency spillway.
- The basin storage volume should be equivalent to the volume of runoff generated by a 2 year-24 hour storm, less expected infiltration.
- Fencing or dense vegetation should be provided to restrict access
- Pond berms may be classified as a dam and require approval by the Water Resources Division of DES

(h) Water Quality Inlets

- Water quality inlets (WQI) should be a three chamber design with the first and second chambers having a combined volume equal to 400 cubic feet per contributing impervious acre. In addition, the minimum depth of the permanent pool in these chambers will be no less than 5 feet.
- The inflow pipe should be constructed and sized to pass the water quality flow rate into the WQI. All additional flows should be passed through another pipe into a detention facility of sufficient capacity to meet applicable peak discharge control requirements.
- When the structure length exceeds twelve feet the first two chambers are proportioned so that the first chamber (grit) is 2/3 of the length and the second chamber (oil) is 1/3 of the length.
- To facilitate clean out, access to each chamber should be provided by means of a separate manhole.
- The walls separating the chambers must be water tight and only allow passage of stormwater through the design ports or pipes. There shall be no additional vents or passageways within the walls.
- All hardware and piping within the tank should be galvanized, corrosion resistant, or stainless steel. Pipes made of PVC are acceptable and in some applications may be preferable, however, these pipes must be constructed of schedule 40 or greater.

11. Erosion control measures

(a) The kinds of BMPs needed during most construction activities will be

determined by the following:

- Potential erodability of exposed soils
- Type and location of construction activity
- Extent of exposed soils
- Time of year construction is to take place
- Time period of exposure of highly erodible soils
- Length and grade of slopes
- Extent of constructed impervious surfaces

(b) The engineer needs to include scheduling, phasing and coordination of construction activities.

Design factors which need to be addressed to avoid a negative impact on water quality include:

- Disturbance into the groundwater table
- Construction near potential landslide areas
- Installation of stream crossing or drainage swales where needed

- Encroachment on stream flow by land fills, culverts, dikes and buildings

(c). Construction Sequence

The construction sequence shall be included on the plans. The following construction sequence is for example purposes only and must be modified to suit each individual project.

1. Cut and clear trees

2. Construct temporary and permanent sediment, erosion and detention control facilities. Erosion, sediment and detention measures shall be installed prior to any earth moving operation that will influence stormwater runoff.

3. All permanent ditches, swales, detention, retention and sedimentation basins to be stabilized using the vegetative and non-structural BMPs

prior to directing runoff to them.

4. Clear and dispose of debris.

5. Construct temporary culverts and diversion channels as required.

6. Grade and gravel roadways and parking areas - all roads and parking areas shall be stabilized immediately after grading.

7. Begin permanent and temporary seeding and mulching. All cut and fill slopes shall be seeded and mulched within 72 hours of their construction.

8. Daily, or as required, constructed temporary berms, drains, ditches, silt fences, sediment traps, etc., mulch and seed as required.

9. Finish paving all roadways and parking lots.

10. Inspect and maintain all erosion and sediment control measures.

11. Complete permanent seeding and landscaping.
12. Remove trapped sediments from collector devices as appropriate and then remove temporary erosion control measures.

Note: The construction sequence must limit the duration and size of area of disturbance.

(d). Temporary erosion control measures

Typical locations of temporary erosion control measures should be shown on the plans. Installation details of the temporary erosion control measures should be shown on a detail sheet. The following notes are an example of erosion control notes which would be shown on a detail sheet, and are intended only for information purposes.

1. Erosion control measures shall be installed as shown on the plans.
2. Silt fences and hay bale barriers are to be maintained and cleaned until all slopes have been adequately stabilized.

3. All disturbed areas shall have a minimum of 4 inches of loam placed before being seeded and mulched.

4. Fill material shall be free from stumps, wood, roots, etc.

5. The bottom of sediment basins shall be periodically cleaned, with the sediment removed to a secure location so as to prevent siltation of natural water ways.

6. After all disturbed areas have been stabilized, the temporary erosion control measures are to be removed and accumulated sediment disposed in a secure location.

7. Earth stockpiles are to be seeded and mulched and have a silt fence installed on the downslope side as shown on the plans.

8. Erosion control measures shall be periodically inspected during the life of the project and after each storm. All damaged silt fences shall be repaired. Sediment deposits shall periodically be removed.

9. Erosion control measures shall be removed when the disturbed area is stabilized. Disturbed area resulting from the silt fence removal operation shall be permanently seeded. All accumulated sediment should be removed and properly disposed of.

PROJECT_____ APPLICATION # _____
TOWN_____ ENGINEER_____
OWNER/DEVELOPER _____

SITE PLAN SHOWING:

- Soils, Y___ N ___
- Wetlands, Y ___ N___
- Drainage system, Y ___ N ___ N/A ___
- Erosion control measures, Y ___ N___
- Permanent stormwater treatment measures, Y ___ N___ N/A ___
- Retention/detention measures, Y ___ N___ N/A ___
- Pre and post development contours and physical features, Y ___ N___

EROSION CONTROL DETAIL SHEET SHOWING:

- Construction sequence, Y ___ N ___
- Limits on amount of unstabilized soils allowed at one time, Y ___ N___
- Limits on the length of time soils will remain unstabilized, Y ___ N___
- Note to stabilize ditches, swales and ponds prior to directing runoff to them, Y ___ N___
- Installation details of temporary and permanent erosion control measures, Y ___ N___
- Temporary and permanent seeding specifications, Y ___ N ___

DRAINAGE REPORT WITH:

- Professional Engineers stamp, Y ___ N ___
- Project narrative, Y ___ N ___
- USGS locus map showing site, Y ___ N ___
- Calculations for:
  - Pre and post development runoff, Y ___ N___
  - Tc, CN, and C values, Y ___ N ___
  - Retention/detention pond sizing, Y ___ N___
  - Ditch/swale sizing, Y ___ N___
  - Drainage system/culvert sizing, Y ___ N___
  - Rip rap sizing, Y ___ N___
- Pre and post development drainage area plan showing both on-site and off-site drainage areas, Y ___ N ___

OTHER DES PERMITS REQUIRED:

- Wetlands Required, Y ___ N___; Obtained, Y ___ N___; NO._____
- Subsurface Required, Y ___ N___; Obtained, Y ___ N___; NO._____
- Design Review Required, Y ___ N___; Obtained, Y ___ N___; NO._____

DES Publication Order Form

Code Number	Title	Quantity	Price	Total
	Stormwater Management and Erosion & Sediment Control Handbook for Urban & Developing Areas in New Hampshire		$25.00	
NHDES-WSPCD-95-3	Best Management Practices for Urban Stormwater Runoff		$5.00	
			Total	

Name:_____

Address:_____

City/Town:_____

State:_____ Zip Code:_____ Phone _(___)

Please return this order form to:

N.H. Department of Environmental Services - PIP Unit
6 Hazen Drive - PO box 95
Concord, NH 03302-0095

All orders must be PREPAID. Make check payable to: *Treasurer, State of New Hampshire.*

APPENDIX

SITE SPECIFIC APPLICATION

SHORELAND CERTIFICATION
&
FACT SHEETS